

# Terrestrial Animal Health Standards Commission Report September 2016

## DRAFT CHAPTER 6.X.

### PREVENTION AND CONTROL OF *SALMONELLA* IN COMMERCIAL CATTLE PRODUCTION SYSTEMS (new)

#### Article 6.X.1.

##### Introduction

Nontyphoidal salmonellosis is one of the most common food-borne bacterial diseases in the world with *Salmonella* Enteritidis and *S. Typhimurium* (including monophasic variants) being the predominant serotypes identified in humans in most countries. *S. Enteritidis* is primarily associated with poultry while *S. Typhimurium* may be present in many mammalian and avian hosts. In addition, these serotypes and several others occur at variable prevalence in cattle depending on the region. For example, in some countries *S. Dublin* and *S. Newport* may also cause salmonellosis in humans. limited number of other serotypes associated with cattle may cause salmonellosis in humans, for example, *S. Dublin* and *S. Newport*.

~~As is the case in most food-producing animals, *Salmonella* infection in cattle is mostly subclinical, although clinical disease such as enteritis, septicemia or abortion can occur. Subclinical infection can be of variable duration including a carrier state, can be of variable duration and can play an important role in the spread of *Salmonella* within and between herds and pose a public health risk.~~

*Herd* size and stocking density may influence the ~~risk~~ likelihood of introduction, dissemination or persistence of *Salmonella*; however, this is also dependent on geographical region, husbandry and other factors such as season and age.

*Salmonella* serotypes and their prevalence in cattle may vary considerably within and between farms, countries and regions. It is important for *Veterinary Authorities* and the producers to consider serotypes of *Salmonella*, their occurrence and the disease burden in cattle and human populations if when they developing and implementing strategies for the prevention and control of *Salmonella* in commercial cattle production systems.

#### Article 6.X.2.

##### Definitions

For the purposes of this chapter:

**Commercial cattle production systems:** means those systems ~~where~~ in which the purpose of the operation includes some or all of the following: breeding, rearing and management of cattle for the production of *meat* ~~and meat products~~ or *milk* ~~and milk products~~.

**Intensive cattle production systems:** means commercial systems ~~where~~ in which cattle are in confinement and are fully dependent on humans to provide for basic animal needs such as food, shelter and water on a daily basis.

**Extensive cattle production systems:** means commercial systems ~~where~~ in which cattle have the freedom to roam outdoors, and where the cattle have some autonomy over diet selection (through grazing), water consumption and access to shelter.

**Feed:** means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial animals (except bees).

**Feed ingredient:** means a component part or constituent of any combination or mixture making up a feed, whether or not it has a nutritional value in the animals diet, including feed additives. Ingredients are of plant (including aquatic plants) or terrestrial or aquatic animal origin, or other organic or inorganic substances.

**Semi-intensive cattle production systems:** means commercial systems in which cattle are exposed to any combination of both intensive and extensive husbandry methods, either simultaneously or variably according to changes in climatic conditions or physiological state of the cattle.

#### Article 6.X.3.

##### Purpose and scope

The purpose of this ~~This~~ chapter is to provide recommendations for the prevention and control of *Salmonella* in commercial cattle production systems in order to reduce the burden of *disease* in cattle and the *risk* of human illness through food-borne contamination as well as human *infections* resulting from direct or indirect contact with infected cattle (e.g. via faeces or abortion material).

This chapter applies to cattle (*Bos taurus*, *B. indicus*, *B. javanicus* and *B. grunniens*), water buffaloes (*Bubalus bubalis*) and ~~wee~~ bison (*Bison bison* and *B. bonasus*) kept in commercial cattle production systems.

This chapter should be read in conjunction with the Codex Alimentarius Code of Hygienic Practice for Meat (CAC/RCP 58-2005), ~~and the Codex Alimentarius Code of Hygienic Practice for Milk and Milk Products (CAC/RCP 57-2004), Code of Practice of Good Animal Feeding (CAC/RCP 54-2004), and the Guidelines for the Control of Nontyphoidal *Salmonella* spp. in Beef and Pork Meat (CAC/GL 87-2016 under development), and the OIE/FAO Guide to Good Farming Practices for Animal Production Food Safety.~~

#### Article 6.X.4.

##### Objectives of prevention and control measures

It is recommended that Prevention prevention and control measures be may focus focused on those serotypes of *Salmonella* of greatest consequence to cattle or and public health. These measures will also contribute to the reduction of other serotypes.

Reduction of *Salmonella* in cattle in primary production may reduce the level of the pathogen:

- 1) ~~entering the slaughterhouse/abattoir and therefore decrease the risk of beef contamination during slaughter and dressing procedures;~~
- 2) ~~in milk and milk products;~~
- 3) ~~in the farm environment, thereby reducing the risk of dissemination of *Salmonella* and contact infections in humans.~~

Prevention and control measures in commercial cattle production systems may:

- 1) reduce the prevalence and concentration amount of *Salmonella* entering the slaughterhouse/abattoir and therefore decrease the challenge to the slaughter and dressing procedures and the likelihood of bovine meat contamination;
- 2) reduce the likelihood of *Salmonella* contamination in milk;
- 3) reduce *Salmonella* contamination of the environment via cattle faecal waste, which in turn will limit infection of animals (including wildlife);
- 4) reduce the likelihood of infections in humans through contact with infected cattle or contaminated material or water.

While control in the primary production phase can decrease the number of animals carrying or shedding *Salmonella*, controls after primary production are also important to minimise the contamination and cross-contamination of carcasses and meat products.

When appropriate, good farming practices and the principles of hazard analysis and critical control points (HACCP) should be taken into account when designing prevention and control measures.

Articles 6.X.5. to 6.X.44<sup>16</sup> provide recommendations for the prevention and control of *Salmonella* in commercial cattle production systems. These recommendations may also ~~have beneficial effects on the occurrence of~~ contribute to the prevention and control of some other infections and diseases.

Article 6.X.5.

Biosecurity

Biosecurity is intended to assist with the prevention and control of *Salmonella*. A biosecurity management plan should be developed according to the commercial cattle production systems employed e.g. intensive or extensive.

The applicability of the measures, described below, will vary according to the type of commercial cattle production system.

When including *Salmonella* as part of a biosecurity management plan it is recommended that the following should be addressed:

- 1) location, design and management of the establishment;
- 2) veterinary supervision of cattle health;
- 3) management of the introduction and mixing of cattle;
- 4) training of personnel in their responsibilities and their role in animal health, human health and food safety;
- 5) maintenance of records including data on cattle health, production, movements, feeding, medications, vaccination, and mortality, and cleaning and disinfection of farm buildings and equipment;
- 6) availability of test results to the farm operator when *Salmonella* surveillance is conducted;
- 7) removal of unwanted vegetation and debris that could attract or harbour pests around cattle premises;
- 8) minimising the entry of wild birds into cattle buildings and feed stores;
- 9) cleaning and disinfection procedures for buildings in which cattle are handled or housed in accordance with Chapter 4.13.: For example, the cleaning and disinfection procedures for intensive calf housing, calving areas and sick pens after emptying may include feeders, drinkers, floor, walls, aisles, partitions between pens, and ventilation ducting. All visible organic material should be removed before disinfection.

When chemical disinfectants are used, the effective concentration and contact time for *Salmonella* should be considered and the choice of disinfectant should take into account the cleaning process. Surfaces should be allowed to dry after disinfection. Disinfectants should be used in accordance with Chapter 4.13.:

- 10) control of pests such as rodents and arthropods and regular assessment of effectiveness;
- 11) control and hygienic procedures for entry and movement of persons and vehicles;
- 12) cleaning and disinfection of equipment and vehicles identified as posing a risk;
- 13) storage and disposal of dead animals, bedding, faeces and other potentially contaminated farm waste in a manner that minimises the likelihood of dissemination of *Salmonella* and prevents the direct or indirect exposure of humans, livestock and wildlife to *Salmonella*. Particular care should be taken when cattle bedding and faeces are applied to land used for horticultural crops intended for human consumption;
- 14) procedures for prevention of dissemination of *Salmonella* when an animal is suspected or known to be infected;

Article 6.X.56.

**Location and design of cattle establishment**

When making decisions on the location and design of cattle *establishments*, it is recommended that ~~mitigation reduction~~ of the ~~risk likelihood~~ of transfer of pathogens, including *Salmonella*, from major sources of contamination be considered. Sources of *Salmonella* may include other livestock *establishments* or areas of application or disposal of contaminated waste or effluent. ~~Transfer~~ Other sources and vectors of *Salmonella* between establishments may involve carriage by include vehicles, equipment, water-courses, persons-personnel, domestic animals, wild birds, rodents, flies and other wildlife.

It is recommended that the The design of intensive cattle production systems should consider the following:

- 1) management of faecal waste to minimise contamination of the establishment;
- 24) adequate drainage for the site and control of run-off water and untreated waste water;
- 32) use of materials for construction that facilitate effective cleaning and disinfection;
- 43) control of the points of entry and movement of vehicles, equipment and persons;
- 5) preventing contamination of feed and water during storage and distribution;
- 64) cattle handling and movements to minimise stress and spread of *Salmonella* infection;
- 75) separation of cattle according to likelihood of different infection with, or susceptibility to, *Salmonella*-risk status;
- 86) restriction of entry of domestic animals, wild birds, rodents, flies and other relevant wildlife.

In extensive cattle production systems, location and design options may be limited; however, applicable biosecurity measures should be considered.

Article 6.X.6.

**Biosecurity management plan**

Biosecurity measures that include management and physical factors designed to reduce the ~~risk~~ of introduction, establishment and spread of animal ~~diseases, infections or infestations~~ to, from and within an animal population would also be expected to assist with the prevention and control of *Salmonella*.

When developing a biosecurity management plan it is recommended that the following be taken into consideration:

- ~~1) Veterinary supervision of cattle health.~~
- ~~2) Management of introduction and mixing of cattle.~~
- ~~3) Training of personnel in their responsibilities and their role in animal health, human health and food safety.~~
- ~~4) Maintenance of records including data on cattle health, production, movements, medications, vaccination, and mortality, and cleaning and disinfection of farm buildings and equipment.~~
- ~~5) Availability of test results to the farm operator when *Salmonella* surveillance is conducted.~~
- ~~6) Removal of unwanted vegetation and debris that could attract or harbour pests around cattle premises.~~
- ~~7) Minimising the entry of wild birds into cattle buildings and feed stores.~~
- ~~8) Cleaning and disinfection procedures for buildings in which cattle are handled or housed. For example, the cleaning and disinfection procedures for intensive calf housing, calving areas and sick pens after emptying may include feeders, drinkers, floor, walls, aisles, partitions between pens, and ventilation ducting.~~

~~When disinfectants are used they should be applied at an effective concentration after a complementary cleaning procedure.~~

- ~~9) Control of pests such as rodents and arthropods when required and regular assessment of effectiveness.~~

- 10) ~~Control of persons and vehicles entering the establishment.~~
- 14) ~~Cleaning and disinfection of vehicles and equipment identified as a risk.~~
- 12) ~~Storage and disposal of cattle carcasses, bedding, faeces and other potentially contaminated farm waste in a safe manner to minimise the risk of dissemination of *Salmonella* and to prevent the direct or indirect exposure of humans, livestock and wildlife to *Salmonella*. Particular care to be taken when cattle bedding and faeces are used as fertiliser for horticultural crops intended for human consumption.~~

#### Article 6.X.7.

##### Management of cattle introductions

To minimise the ~~risk~~ likelihood of introducing *Salmonella* through cattle introductions, it is recommended that:

- 1) ~~There be~~ good communication within the cattle industry should be encouraged to raise awareness of the ~~risk~~ likelihood of introducing *Salmonella* through cattle introductions-;
- 2) ~~The number of separate sources of cattle for breeding or rearing be kept to as few as possible. For example in a closed dairy herd it is possible to introduce new genetic material solely by semen or embryos. consideration~~ should be given to minimising the number of sources of replacement cattle;
- 3) the introduction of new genetic material should be introduced through the use of semen and embryos be considered whenever practicable;
- 43) if possible, cattle should be sourced directly from *herds* of origin because live animal markets or other places where cattle from multiple properties are mixed for resale may increase the ~~risk~~ likelihood of spread of *Salmonella* and other ~~infections~~ infectious agents among cattle-;
- 54) newly introduced cattle should be kept separate from the rest of the *herd* for a suitable period before mixing with other cattle, e.g. four weeks-;
- 5) ~~Where appropriate, for example with cattle of unknown status, pooled faecal samples from introduced cattle could be taken to assess their *Salmonella* status.~~
- 6) where when appropriate, testing of animals for *Salmonella* prior to introduction or mixing with other cattle should be considered to inform subsequent control measures, for example, when introducing cattle of unknown status.

#### Article 6.X.8.

##### On farm cattle management

To minimise ~~reduce~~ the ~~risk~~ likelihood of transferring *Salmonella* among cattle, it is recommended that:

- 1) cattle with suspected salmonellosis or otherwise sick should be separated from healthy cattle-;
- 2) care of healthy cattle should be carried out prior to care of cattle with suspected salmonellosis-;
- 3) priority should be given to the hygienic management of calving areas, for example keeping perinatal cattle separated from sick cattle and maintaining a clean environment-;
- 4) cattle should be segregated according to age;
- 54) when possible, the 'all-in-all-out' principle for production cohorts should be used. In particular, the unnecessary mixing of different age groups during rearing, especially of calves, should be avoided-;
- 65) consideration should be given to the potential for between-herd transmission of *Salmonella* via breeding, rearing and grazing of cattle from multiple sources on a single site, for example shared pasture, and heifer rearing- or sharing of bulls;

- 76)** consideration **should** be given to the potential for between-herd transmission of *Salmonella* through direct contact between cattle across boundary lines or indirectly, for example through contamination of water courses.

Article 6.X.9.

~~Feed and water~~ **Feed and feed ingredients**

4. ~~Compound feed~~ **Feed and feed ingredients**

~~Compound feed~~ ~~Feed~~ and feed ingredients can be sources of *Salmonella* infection for cattle. For the effective control of *Salmonella* ~~it is recommended that~~:

- 1a) ~~Where~~ when appropriate, ~~compound~~ feed and feed ingredients **should** be produced, handled, stored, transported and distributed according to Good Manufacturing Practices, considering Hazard Analysis Critical Control Points (HACCP) principles and recommendations in accordance with Chapter 6.3.
- 2b) ~~Compound~~ where practical, feed and feed ingredients **should** be transported, ~~and~~ stored and fed in a hygienic manner that minimises contamination by manure and access by domestic animals, ~~wild~~ birds, rodents and ~~other~~ *wildlife*.

2. ~~Water~~

~~Where there is reason to be concerned about infection of cattle with *Salmonella* from contaminated water, measures be taken to evaluate and minimise the risk. For example sediment in water troughs may act as a reservoir for contamination.~~

Article 6.X.10.

Water

~~Drinking water~~ **Water for drinking** should be of an appropriate quality. When there is reason to be concerned about infection of cattle with *Salmonella* from contaminated water, measures should be taken to evaluate and minimise the risk. For example sediment in water troughs may act as a reservoir for contamination. Where practicable, untreated surface water should be avoided as a water source.

Article 6.X.11.

~~Prevention, treatment and control~~ **Additional prevention and control** measures

- 1) The immune status of calves is important and therefore care should be taken to ensure that new-born calves consume adequate amounts of high quality colostrum in accordance with Article 7.9.5. (point 3c)) and Article 7.X.5. Raw milk from infected cows should not be fed to calves.
- 1) ~~Antimicrobial agents may modify normal flora in the gut and increase the likelihood of colonisation by *Salmonella*. If antimicrobial agents are used, they should be used in accordance with Chapter 6.9. Antimicrobial agents should not be used to control subclinical infection with *Salmonella* in cattle because the effectiveness of the treatment is limited, they may increase the risk of *Salmonella* colonisation, and their use can contribute to the development of antimicrobial resistance.~~
- 2) Vaccination may be used ~~considered~~ as part of a *Salmonella* control programme. Vaccine production and use should be in accordance with Chapter 1.1.6. of the *Terrestrial Manual*. The protective effect of vaccines is generally serotype specific and few licensed vaccines are available for cattle and is influenced by factors such as timing of vaccination in relation to exposure.
- 3) ~~Use of probiotics may reduce colonisation of cattle by *Salmonella* and shedding of *Salmonella*; however, efficacy is variable.~~
- 34) ~~Because conditions such as A number of conditions, for example liver fluke and infection with bovine viral diarrhoea virus, may increase the susceptibility of cattle to *Salmonella*; therefore control of these such conditions is recommended.~~
- 5) ~~The immune status of calves is important and therefore care should be taken to ensure that new-born calves consume adequate amounts of high quality colostrum.~~

- 4) Stress may increase the susceptibility of cattle to *Salmonella*. Management of potentially stressful situations, such as mixing of groups of cattle, may reduce the likelihood of clinical disease or shedding of *Salmonella*.
- 5) Antimicrobial agents may modify normal flora in the gut and increase the likelihood of colonisation by *Salmonella*. In circumstances when antimicrobial agents are considered necessary for the treatment of clinical enteric salmonellosis, they should be used in accordance with Chapter 6.9. Antimicrobial agents can be used for treatment of clinical salmonellosis and when administered, it should be in accordance with Chapter 6.9. Furthermore, however, antimicrobial agents should not be used to control subclinical infection with *Salmonella* in cattle because the effectiveness of the treatment is limited, they may increase the risk of *Salmonella* colonisation, and their use can contribute to the development of antimicrobial resistance.

Article 6.X.11~~12~~.

#### Transportation

Hygienic maintenance of vehicles is recommended. Vehicles should be properly cleaned and disinfected after transportation of animals.

When transporting animals from multiple establishments, it is recommended that the *Salmonella* status of the establishments should be considered to avoid cross-contamination of cattle.

In addition, the relevant recommendations in Chapters 7.2., 7.3. and 7.4. apply.

~~When transporting animals from multiple establishments, it is recommended that the *Salmonella* status of the establishments be considered to avoid cross-contamination of cattle.~~

Article 6.X.12~~13~~.

#### Lairage

Relevant aspects of *lairage* management include consideration of effective cleaning and *disinfection* between groups, minimising mixing of ~~separate groups~~ animals that have not continuously been kept together and managing stress.

In addition, the relevant recommendations in Articles 7.5.1., 7.5.3. and 7.5.4. apply.

Article 6.X.14.

#### Cleanliness of hides

Cleanliness of hides can be achieved by applying suitable practices during housing (for example additional clean bedding), transport and lairage. Dirty hides increase the risk of microbial contamination of carcasses during the slaughter process. Contamination can be reduced by hide washing of the live animal or of the slaughtered animal before hide removal.

Article 6.X.13~~15~~.

#### ~~Surveillance in cattle for *Salmonella* in commercial cattle production systems~~

~~Surveillance data provide information to assist the Competent Authorities in their decision making regarding the requirement for, and design of, control programmes and in setting and verifying performance objectives. Sampling and testing methods, frequency and type of samples required should be determined by the Veterinary Services.~~

Standards for diagnostic tests are described in the *Terrestrial Manual*. In addition, other sampling and testing methodologies such as testing of bulk milk or serum samples by ELISA may provide useful information on *herd* or individual animal status. Boot swab samples from communal areas in cattle housing, slurry samples, or caecal or lymph nodes samples collected post-mortem can also be useful for microbiological testing. Some types of *Salmonella* such as *S. Dublin* can be difficult to detect ~~through~~ using microbiological methods.

~~If vaccination is used, If serology is used as the surveillance method, it may not be possible to distinguish between vaccinated and infected cattle by means of serological testing.~~

Article 6.X.1416.

**Prevention and control in low prevalence regions**

In regions where *Salmonella* infection of cattle is uncommon, it may be possible to maintain low prevalence status or eliminate *infection* from *herds* through a combination of good farming practices, herd surveillance, individual testing, movement controls, and possible or and removal of persistent carriers.

-----  
— Text deleted.